ToxiRAE II

PGM-1100 Series
Personal Toxic Gas Monitor

ISO 9001
CERTIFIED

RAE SYSTEMS

User Manual

045-4003-000, Rev C May 2007

- READ BEFORE OPERATING -

This manual must be carefully read by all individuals who have or will have the responsibility of using, maintaining, or servicing this product. The product will perform as designed only if it is used, maintained, and serviced in accordance with the manufacturer's instructions.

CAUTION!

⚠ **To reduce the risk of electric shock, turn off power before removing the monitor cover. Disconnect the battery before removing sensor module for service. Never operate this monitor while the cover is removed. Remove monitor cover and sensor module only in an area known to be non-hazardous.**

⚠ **Sensors are not interchangeable; use only RAE Systems sensors, and use only the sensor type specified for your ToxiRAE II monitor. Use only RAE Systems batteries. Use of non-RAE Systems components will void the warranty and can compromise the safe performance of this product.**

⚠ **Calibrate before use.**

⚠ **Make sure gas inlet is free of dirt and debris.**

⚠ **Properly recycle Lithium batteries when disposing.**

US & Canadian Intrinsic Safety

UL/cUL Class I, Groups A, B, C, D, T6

European Intrinsic Safety

CE 0575 ⟨Ex⟩ II 1G EEx ia IIB T5 / 2G EEx ia IIC T5

DEMKO 02 ATEX 0233306X

$-40°C \leq T_{amb} \leq 55°C$

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Standard Contents

ToxiRAE II monitor with sensor as specified
High-capacity Lithium battery installed
Gas adapter
Alligator clip
Stainless steel belt clip / hardhat adapter
Operation instructions

Calibration Kit

Test gas (for sensor as specified)
Gas regulator with flow controller
Hard transport case

General Information

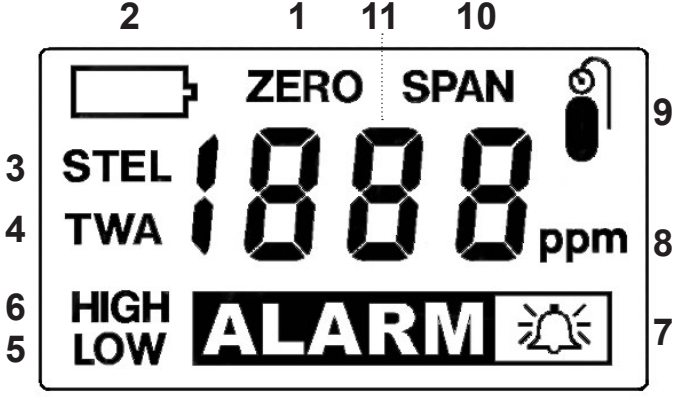
The ToxiRAE II single gas monitor continuously displays toxic gas concentrations. The ToxiRAE II is a full-featured gas monitor providing continuous, digital display of the selected toxic gas concentration, STEL, TWA and Peak values as well as high, low, TWA and STEL alarms.

Physical Description

1 Bright red LED Alarm
2 Display
3 Audio Alarm
4 Gas Inlet
5 Button
6 Alligator Clip

Display Features

1 Zero Calibration
2 Low Battery Indicator
3 Short Term Exposure Limit (STEL)
4 Time Weighted Average (TWA)
5 Low Alarm
6,7 High Alarm
8 Parts Per Million (ppm)
9,10 Span Calibration
11 Gas Concentration



Operating the ToxiRAE II

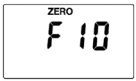
Turning the Monitor ON

NOTE: Turn the monitor on in clean ambient air because the sensor is zeroed at power on.

Make sure the Lithium battery is installed.

Hold the button down and release when it beeps. The monitor is now on.

The monitor will perform a self-test preceding the warm-up and zero calibration.



You will see the firmware version displayed briefly (e.g., “F10” means firmware version 1.0). The the current gas concentration reading is displayed.

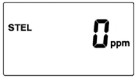
Using the ToxiRAE II

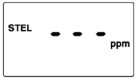
After the monitor is turned on and completes its warm-up, it is in Monitor Mode. The display shows the current concentration of the specified gas in ppm.

You may also view exposure analysis—the STEL, TWA, and PEAK—in Monitor Mode.

From the current gas concentration, press the button to cycle through each exposure analysis reading. After a minute of idle time, the monitor automatically returns to the current gas concentration display from any of the analysis displays.

Short Term Exposure Limit (STEL)





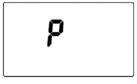
The STEL is the average reading of the gas concentration for the last 15 minutes.

NOTE: The STEL reading does not appear until 15 minutes have elapsed.

Time Weighted Average (TWA)

The TWA is the accumulated reading of the gas concentration since the monitor was turned on, divided by 8 hours.

Peak Reading (PEAK)

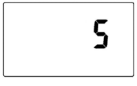


The peak reading is the highest reading since the monitor was turned on.

NOTE: The display switches back and forth between “P” and the actual peak reading.

If the preset alarm limits are exceeded, the monitor goes into alarm, and you should leave the contaminated area immediately. *See **Table A** for the preset limits.*

Turning the Monitor OFF



Hold the button down, through the “5…4… 3… 2… 1… OFF” sequence.

The monitor is off when the display is blank.

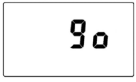
Program Mode

Use the Program Mode to perform any of the following actions (listed in order of appearance):

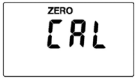
Calibration

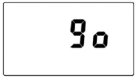
Changing Preset Limits or Span Gas Values

Entering Program Mode (Firmware Version 1.4, sensors for HCN, NO, NO_2, PH_3, or NH_3): The instrument must first be turned **on**. Press and hold the button for 3 seconds, and release it when "Pro" flashes in the display. Then, hold the button down until the display reads "on". (To exit the Program Mode at this point, do not press the button, and the monitor will automatically return to the Monitor Mode.) Press and hold the button again. Release it when "go" starts flashing on the screen. You are now in Program Mode.



Entering Program Mode (Firmware Version 1.7, sensors for CO, CO High Range, H_2S, O_2, or SO_2): The instrument must first be turned **off**. Press the button rapidly, 3 times in succession. "Pro" appears in the display. Immediately hold the button down again until the display reads "on." The display counts down and the buzzer, lights, and vibration alarms are tested. "Cal" and "Go" are alternately shown. You are now in Program Mode.





To exit the Program Mode press the button until "Pro" and "End" appear. Hold the button down for 5 seconds and release. The ToxiRAE II is now in Monitor Mode. (If the monitor is in Program Mode, it automatically exits to Monitor Mode

Calibration

All newly purchased ToxiRAE II instruments should be bump tested by exposing the sensor to known concentration calibration gas before the instrument is used or put into service. A bump test is defined as a brief exposure of the monitor to the calibration gas and the sensors to show response and trigger the lowest alarm set point for each sensor.

The ToxiRAE II must be calibrated if it does not pass a bump test, or at least once every 180 days, depending on use and sensor exposure to poisons and contaminants.

- Calibration intervals and bump test procedures may vary due to national legislation.
- RAE Systems recommends using RAE calibration gas.
- Any rapid up-scale reading followed by a

declining or erratic reading may indicate a gas concentration beyond the upper scale limit, which may be hazardous.

For maximum safety, the accuracy of the monitor should be checked by exposing the sensor to known concentration calibration gas before each day's use (field calibration).

You will see the "CAL" (calibration) and "go" messages switch back and forth on the screen.

To advance or skip to the next submenu, press the button once.

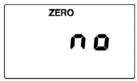
Zero Calibration

To perform a zero (fresh air) calibration, press and hold the button. Release when "go" displays continuously without flashing on and off.

There will be a countdown from 10 to 0. When it is done, the display will show "dn" (done).

Note: To interrupt the zero calibration while it is in progress, press and hold the button. The countdown stops, and the display shows "no."

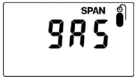
Press the button again to confirm and advance to the next submenu.

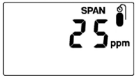


Span Gas Calibration

To perform span gas calibration, press and hold the button. Release when “go” displays continuously without flashing on and off.

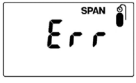
The “gAS” and span gas preset value switches back and forth on the screen. During these 10 seconds, connect the span gas to the monitor. (*See picture on page 11.*)





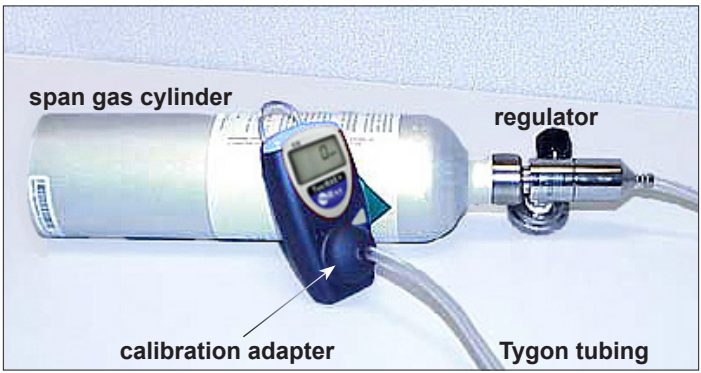
When the monitor detects a change in gas concentration or after 10 seconds of idle time, or when the key is pressed, the 90-second countdown timer begins.

Span calibration fails when the monitor does not detect any change in gas concentration. In the latter case, the “Err” (error) message appears on the screen, the monitor beeps and the LED lights up. In either case, begin span calibration again.

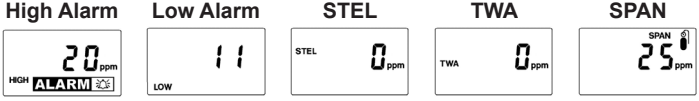


When span calibration is complete, “dn” (done) and the real time reading briefly appear on the screen before advancing to the next submenu.

To interrupt and exit span calibration during the 90-second countdown, press the button and “no” appears on the screen. Press the button again to confirm and advance to the next submenu.



Changing Preset Limits or Span Gas Values



Example:
Changing the High Alarm preset

Cycle through the submenus by pressing the button once after each; stop at appropriate screen. (The monitor returns to the Monitor Mode after the span gas value.)

You will see “SEt” and “go” switch back and forth on the screen, prompting you to change the preset limit or value.

To change the preset, press and hold the button. Release when “go” stops flashing.

The current preset will appear on the screen. The blinking digit is the one that will change.

To change the digit, press the button and it will increase by one increment; the digits cycle from 0 through 9.

To move to the next digit, hold the button down and release when the next digit starts blinking.

To save the new limit, hold the button and release when “dn” appears on the screen. The monitor will advance to the next submenu.

To exit the Program Mode press the button until “Pro” and “End” appear. Hold the button down for 5 seconds and release. The ToxiRAE II is now in Monitor Mode.

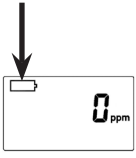
Maintenance

Follow these instructions carefully and calibrate and test your monitor according to this User Manual's instructions before placing it in service again.

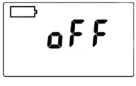
Replacing the Lithium Battery

The ToxiRAE II is shipped with its Lithium battery installed.

Change the battery when the low battery symbol appears. When a battery needs replacement, the alarm beeps and flashes once a minute until a fresh battery is installed.



Just before the battery dies, "oFF" will appear instead of the reading. The alarm will continue to beep, flash and vibrate for a minute until the battery is dead.



⚠ CAUTION!

Change the battery only in an area known to be non-hazardous.

⚠ Warning!

Use only the following battery model:

EVE ER14335

Step 1. To replace the battery, remove the four screws from the back of the monitor.

Step 2. Remove the back cover.

Step 3. Gently pull the ribbon to remove the battery from the monitor.

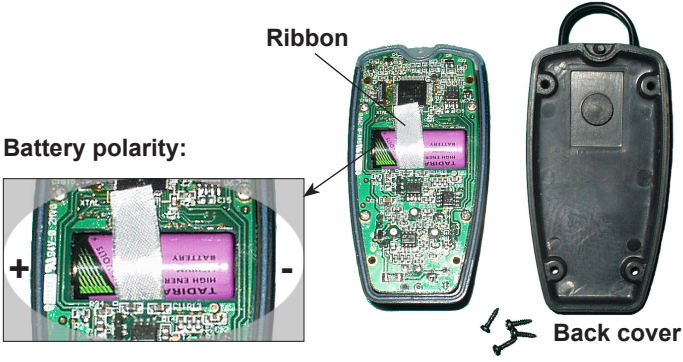
Step 4. Install a Lithium battery (Voltage: 3.6V, Capacity: 1.65AH, Size: 2/3AA, P/N: 500-0076-000).

Important! Use only RAE Systems batteries. Use of non-RAE Systems components will void the warranty and can compromise the safe performance of this product.

Make sure the ribbon rests underneath the battery. Note the polarity of the battery.

Step 5. Reattach the back cover and tighten the screws.

Step 6. Calibrate and test your ToxiRAE II.



Replacing the Filter (All Versions)

The ToxiRAE II has a removable sensor cover that allows you to change the sensor filter. Replace the filter (P/N: 045-2045-000) when it appears dirty or when the sensor is replaced.

To remove the sensor cap, use the calibration adapter to turn the sensor cap one quarter-turn counterclockwise. Next pull off the sensor cap.

Then carefully remove the filter and replace it with a new one. Avoid touching the sensor.

Replace the sensor cap and calibrate and test the monitor before placing it back in service.

Replacing the Sensor (All Non-U.S. Versions)

ToxiRAE II models available outside the U.S. allow you to change the sensor.

⚠ **New sensors need to warm up before first calibration and use.** (*See **Table A** for required warm-up times.*)

To replace the sensor, use the calibration adapter to turn the sensor cap one quarter-turn counterclockwise. Next pull off the sensor cap.

Then carefully remove the sensor by pulling it straight out. Also remove the filter that is held in place with an o-ring, located in the ToxiRAE II housing above the sensor.

Replace these with a new sensor and filter. Replace the filter (P/N: 045-2045-000) when it appears dirty or when the sensor is replaced. (*See **Table A** for sensor part numbers.*)

⚠ **Sensors are not interchangeable. Use only RAE Systems sensors, and use only the sensor type specified for your ToxiRAE II monitor. Use of non-RAE Systems components will void the warranty and can compromise the safe performance of this product.**

Make sure the pins are not bent or corroded. Align the pins to the corresponding holes and push the sensor straight in. The sensor should fit flush against the printed circuit board.

Replace the sensor cap and calibrate and test the monitor before placing it back in service.

Specifications

Size	3.6" (9.3 cm) x 1.9" (4.9 cm) x 0.9" (2.2 cm)
Weight	3.6 oz (102 gm) with clip
Battery	User-replaceable 2/3 AA high-capacity Lithium battery
Operating Period	2 years typical battery life for CO/H_2S/O_2 sensors or 730 minutes of alarm. All other low- or high-bias sensor-equipped models, typical 1 year or 360 minutes of alarm. Extra battery included for use if maximum alarm minutes are exceeded.
Display	Easy-to-read LCD for continuous display of concentration in ppm and text messages
Keypad	One-button operation
Direct Readout	• Instantaneous display of toxic gas concentration in ppm (or oxygen in %) • STEL & TWA values • Peak hold
Alarms	• Audible: 90dB at 10 cm • Visual: Bright Red/Green LED bar visible from top, front, and sides • Sensory: Built-in vibration alarm • High: Displays “High” emits 3 beeps and flashes per second • Low: Displays “Low” 2 beeps and flashes per second • STEL: Displays “STEL” 1 beep and flash per second • TWA: Displays “TWA” 1 beep and flash per second
Calibration	Two point field calibration; Auto-zero at startup, user intiated span/standard reference gas.
EMI/RFI	Highly resistant to EMI / RFI. Compliant with EMC Directive 89/336/EEC
IP Rating	rating: protected against dust, protected against low pressure jets of water from all directions
Hazardous Area Approval	• UL/cUL Classified as Intrinsically Safe for use in Class I, Division 1 Groups A, B, C, D, Hazardous Locations T6 rating • ATEX II 1G, EEx ia IIB T6, **II 2G, EEx ia IIC T6** CE European Conformity (Conformite Europene)
Temperature	• Continuous: -4° to 114° F (-20° to 45° C) • Intermittent: -40° to 120° F (-40° to 55° C)
Humidity	95% relative humidity (non-condensing)
Attachments	Wrist strap, stainless-steel alligator clip (installed), stainless-steel belt clip/hard-hat adapter
Warranty	2-year warranty for instrument and CO/H_2S/O_2 sensors (all other sensors have 1-year warranty)

**Ongoing projects to enhance our products means that these specifications are subject to change.*

Table A: **Sensor Configuration**

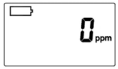
Sensors are not interchangeable. Use only RAE Systems sensors, and use only the sensor type specified for your ToxiRAE II monitor. Use only RAE Systems batteries. Use of non-RAE Systems components will void the warranty and can compromise the safe performance of this product.

Sensor and Part Number	Range (ppm)	Resolution (ppm)	Span Gas (ppm)	Low (ppm)	High (ppm)	STEL (ppm)	TWA (ppm)	Sensor Warm-Up Time **
NH_3 045-0518-000	0-50	1	50	25	50	35	25	4 hours
CO 045-0512-000	0-500	1	100	35	200	100	35	20 min
CO* 045-0512-200	0-1999	100	100	35	200	100	35	20 min
Cl_2* 045-0516-000	0-10	0.1	10	0.5	5	1	0.5	20 min
ClO_2* 045-0523-000	0-1	0.01	0.5	0.2	0.5	0.3	0.1	20 min
HCN* 045-0517-000	0-100	1	10	4.7	50	4.7	4.7	20 min
H_2S 045-0511-000	0-100	1	25	10	20	15	10	20 min
NO* 045-0514-000	0-250	1	25	25	50	25	25	4 hours
NO_2* 045-0515-000	0-20	0.1	5	1	10	1	1	20 min
O_2* 070-0003-002	0-30	0.1	20.9% (air)	19.5	23.5	-	-	20 min
PH_3* 045-0519-000	0-5	0.01	5	1	2	1	0.3	20 min
SO_2* 045-0513-000	0-20	0.1	5	2	10	5	2	20 min

**Call for availability*

*** Applies to newly installed sensor only*

Table B: **Alarm Signals (H_2S)**

Alarm Type	Display	Cause	Buzzer & LED	Vibration Alarm
Over Range		Reading > maximum range	3 beeps/sec	once every second
High		Reading > High Alarm Limit	3 beeps/sec	once every second
Low		Reading > Low Alarm Limit	2 beeps/sec	once every second
TWA		TWA reading > TWA Limit	1 beep/sec	once every second
STEL		STEL Reading > STEL Limit	1 beep/sec	once every second
Negative		Reading < 0 ppm	1 beep/sec	once every second
Battery Low		Battery < 3.2V	1 beep/min	None
Battery Dead		Battery < 3.1V	1 beep/sec	once every second

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Technical Service 888.723.4800
Tech@raesystems.com

SPECIAL NOTE: If the monitor needs to be serviced, contact either:

the **RAE Systems distributor** where the unit was purchased; they will return the monitor on the user's behalf,

or the **RAE Systems Technical Service department**. Before returning the unit for service or repair, obtain a Returned Material Authorization (RMA) number for proper tracking of your equipment. This number needs to be on all documentation and posted on the outside of the box in which the monitor is returned for service or upgrade. ***Packages without RMA Numbers will be refused at the factory.***